User's Manual

HandheldDigital Pressure-Meter

GMH3110

Version 4.7

for GMSD – Pressure Sensors

CE

Ihr kompetenter Ansprechpartner / Your competent contact partner :

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1 General

1.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.
   Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).
5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
   Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.
   In case of doubt, please return device to manufacturer for repair or maintenance.

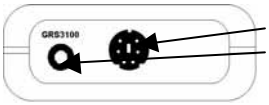
1.2 Operation And Maintainance Advice

- **Battery Operation**
  If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.
  Please note: We recommend to take out battery if device is not used for a longer period of time!

- **Mains Operation With Power Supply**
  Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 V DC. Do not apply overvoltage!! Cheap 12V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply GNG10/3000.
  Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.

- **Connecting/Changing Sensors**
  Do not use insuitable sensors. Connecting other devices/sensors as specificated may cause a damage to the instrument and device/sensor! Switch off device before changing the sensor.
  Connect sensor before switching on the device, otherwise the sensor may not be detected correctly.
  When connecting the sensor the connector may not lock correctly. In such case take the plug not at the casing but at the buckling protection at the end of the plug. If plug is entered correctly, it will slide in smoothly. To disconnect sensor do not pull at the cable but at the plug (to open locking mechanism).

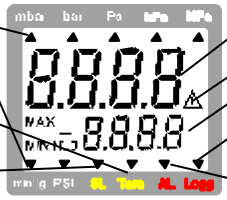
1.3 Connections



Connection for pressure sensors of the GMSD-family (p.r.t. chapter 9)
Interface: Connection for el. isolated interface adapter (p.r.t. chapter 6)
The mains adapter socket is located at the left side of the device.

1.4 Display

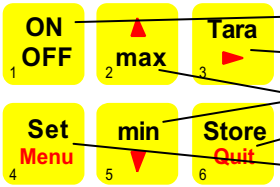
Units: an arrow points to the chosen measuring unit
Tara: appears if tara-function is activated.
SL: appears if sea-level-correction is activated



main display: shows measuring value.
⚠: indicates weak battery or other warnings
secondary display: min-, max- or hold value
Logg: no function
AL: no function

1.5 BasicOperation

When switching on the device and a zero point adjustment was carried out it shows shortly „nuLL Corr".



On-/Off-Switch
Tara: Calling of tara function, zero point adjustment
min/max: Showing the min- resp. max-memory in sec. display
Store/Quit: Calling of hold function
Set/Menu: Calling of configuration

Max Memory: Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key ´max´ for >2 seconds.

Min Memory: Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key ´min´ for >2 seconds.

Hold Function: By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it.

Tare Function: By pressing ´Tara´ (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.
Please Note: Activating/deactivating tara clears the max- & min-memories.

Zero-Point Adjustment: (for rel. pressure sensors only) If there is no pressure applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out.
To carry out the adjustment press key 3 for 5 seconds.
(Please note: A zero-point adjustment can only be carried out if the difference between the value on display and the value calibrated on site is less than 2%! E.g. for the measuring range of –1.00 ..+25.00mbar, =>zero-point adjustment up to 0.50mbar possible)
To recall the manufacturer`s calibration press button 3 for approx. 7 seconds.
Note: If a zero-point adjustment was carried out, this will be signalled by the short displaying of „NuLL Corr" when switching on the device.

2 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu.
Pressing key ***Menu*** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
Quit (key 6) finishes the configuration and returns to standard measuring operation.

2.1 Unit: Coice Of The Display Unit

Choose the desired display unit, the refering unit is displayed by means of a functional arrow in the display. The selection is permanently stored in the sensor, therefore after reconnecting the sensor the unit will instantly reapear. The choice depends on the used sensor.
The unit [m] =H_2O is just supported by devices with [m] printed below the display!

2.2 Sea Level Correction For Absolute Pressure Sensors

The device displays the absolute pressure measured at the sensor. This is not necessarily the same like the values given by weather stations! The weather stations' values are pressure at sea level. Usually the sensor is placed above sea level and therefore, if the value at sea level(zero) is to be measured, the pressure loss resulting from the actual level above zero has to be considered!

- To correct activate the „Sea-Level-Function":
  Select „on" in the menu „SL" with ▲ (key 2) or ▼ (key 5).

- Jump to the next parameter „Alti" py pressing ***Menu*** (key 4).
  Then enter the altitude above sea level of the sensor's location in meters and leave the configuration by pressing ***Quit*** (key 6)

If the sea level correction is active this will be shown by the functional arrow „SL" in the display, the device now displays the absolute pressure at sea level (zero).

2.3 P.oFF: Auto Power Off Time

The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time.
The power off time can be set to values between 1 and 120 min. It can be completely deactivated by setting the paramter to ‚P.oFF = oFF".

2.4 Adr: Base Address of Interface

Up to 10 devices of the GMH3xxx- handheld-family can be connected to a serial interface at once (depending on interface converter, e.g. GRS3105: 5 devices). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

3 Measuring Of Water Level – Display Unit [m]

(only for devices with ‚m' printed below the display)
When using a suitable waterproof pressure sensor the unit [m] for meters of water can be set in the menu "Unit". 10m of water are roughly 1 bar over pressure. Measurings can be made e.g.like described below :

- With abs. pressure sensor (SL oFF!): Press ‚Tara' when sensor is at ambient air and then bring sensor to the depth to be measured. The display shows now the depth in [m].
- With rel pressure sensor: bring tube connection for lower press. in contact to ambient air by means of a tube (no water contact!) and bring the sensor with its open press. connection for higher pressure to water depth to be measured (display and is compensated for pressure changes in ambient air).

4 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificied for its accuracy, it is the best solution to return it with the refering sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

5 Pressure Connection To The Sensors

The device is designed to be connected to the sensors of the GMSD...-series without a new calibration being necessary. Therefore a great variety of replaceable sensors of e.g. –1.999...2.500 mbar relative up to 0...400.0 bar absolute pressure can be connected to the device (p.r.t. chapter 9)

Relative Pressure Sensors (Types: GMSD...MR. GMSD...BR)

- **For measurements of over- or under pressure:**
  Connect plastic tube with internal dia of 4 mm to pressure port "B". Port "A" will not be used!
  Pressure sensors GMSD 2,5 MR, GMSD 25 MR and GMSD 350 MR allow for measurements of under pressure up to the entire over pressure measuring range by re-plugging the tube to pressure port "A". Please note that all values are displayed as positive values. No minus sign will be shown. (Example for GMSD 25 MR: For tube connection "B" the measuring range covers -19.99 to 25.00 mbar. If you replug to port "A" under pressure measurements down to -25.00 mbar could be carried out with the display showing the value 25.00 (no minus sign).
- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal dia of 4 mm to pressure port "B" and "A"; make sure to apply higher pressure to port "B".

Absolute pressure sensors: (types: GMSD...BA)

Connect plastic tube with an internal dia of 4 mm to pressure port "A". (Port "B" is not used.)

Stainless steel pressure sensors: (types: GMSD...MRE, GMSD...BRE, GMSD...BAE)

For measurements of over-, under- or absolute pressure screw sensor to G1/4" pressure terminal or plug plastic tube to a suitable adapter.

6 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (GRS3100 or GRS3105) the device can be connected to a computer for data transfer. With the GRS3105 up to 5 devices of the GMH3xxx- series can be connected to one interface (see also manual of GRS3100 or GRS3105)
To avoid transmission errors, there are several security checks implemented e.g. CRC.
The following standard software packages are available:

- **EBS9M**: 9-channel software to display the measuring values
- **EASYCONTROL**: Universal multi channel software (EASYBUS-, RS485-, or GMH3000- operation possible) for real-time recording and presentation of measuring data of one GMH3xxx device in the ACCESS®-data base format

In case you want to develop your own software we offer a **GMH3000-developmentpackage** including:

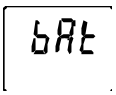
- a universally applicable Windows functions library ('GMH3000.DLL') with documentation
- Programming examples Visual Basic 4.0, Testpoint (Keithley Windows measuring software)

Note: ***The measuring and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!***

Supported functions:

Code	Name/ Function	Code	Name/ Function
0	Read measurement value	180	Read kind of measuring of sensor
3	Read system state	194	Set display unit
6	Read min memory	199	Read kind of measuring of display
7	Read max memory	200	Read min display range
12	Read ID number	201	Read max display range
32	Read configuration flag BitCorrectToSealevel:32 (only abs. press. Sensors)	202	Read display range - unit
		204	Read display range – decimal point
160	Set configuration flag (see above)	208	Read #of channels
174	Clear min memory	220	Read altitude (only abs. press sensors)
175	Clear max memory	221	Set altitude (only abs. press sensors)
176	Read min measuring range	222	Read power off time (Conf-P.oFF)
177	Read max measuring range	223	Set power off time (Conf-P.oFF)
178	Read measuring range – measuring unit	240	Reset
179	Read measuring range –decimal point	254	Program version

7 Error And System Messages

Display	Meaning	What to do?
	Low battery power, device will only continue operation for a short period of time	Replace battery
	Battery empty	Replace battery
	Mains operation without battery: wrong voltage	Check power supply, replace it when necessary
or Err.9	No sensor connected	Switch off device and connect sensor
	Connected sensor or device defective	If second sensor available, check if device is ok. Return defective device/sensor to manufacturer for repair
Err.9	Measured value far out of allowable range	Check: pressure not within sensor range?
No display or confused characters, device does not react on keypress	Battery empty	Replace battery
	Mains operation without battery: wrong voltage or polarity	Check power supply, replace it when necessary
	System error	Disconnect battery and power supplies, wait shortly, then reconnect
	Device defective	Return to manufacturer for repair
Err.1	Measured value above allowable range	Check: pressure not within sensor range? -> measuring value to high
	Sensor defective	Return to manufacturer for repair
Err.2	Measured value below allowable range	Check: pressure not within sensor range? -> measuring value to low
	Sensor defective	Return to manufacturer for repair
Err.4	Value is too low to be displayed, tara is set	Check: display below -2000 (tara?)?
Err.7	System error	Return to manufacturer for repair

8 Specification

Measuring ranges:

Display range:	max. -1999...9999 digit, depending on connnected sensor
Resolution:	depending on connnected sensor
Pressure units:	mbar, bar, kPa, MPa, mmHg, PSI mH_2O (only for devices with ‚m' printed below display), selectable depending on connnected sensor
Accuracy: (typ.)	±0,1%FS (atnominal temperature) (FASt and P.dET: ±0.5%FS)
Measuring rate:	4 meas./sec
Nominal temperature:	25°C

Sensor:	All sensors of the GMSD..-series without recalibration can be connected
Connection:	Mini-DIN-Socket with locking mechanism The sensor will automatically be detected, the measurement range settings are set refering to to sensor data

Power-Off-Function: Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated.

Display: 2 four digit LCDs (12.4mm high and 7 mm high) for measuring values, and for min/ max memories, hold function, etc. as well as additional functional arrows.

Pushbuttons: 6 membrane keys

Interface: Serial interface (3.5mm jack) can be connected to RS232 interface of a PC via electrically isolated interface adapter GRS3100 or GRS3105 (see accessories).

Power supply:	9V battery, type: IEC 6F22 (included in scope of supply) as well as additional d.c.connector (diameter of internal pin 1.9 mm) for external 10.5-12V direct voltage supply. (suitable power supply: GNG10/3000)
Power consumption:	Slow measuring rate: < 1.5 mA
Low battery warning:	⚠-display and ' bAt '

Housing:	impact-resistant ABS, membrane keyboard, transparent panel, Front side IP65
Dimensions:	142 x 71 x 26 mm (L x W x D)
Working temperature:	0...+50°C
Allowable rel. humidity:	0...95 % r.H. (not condensing)
Storage temperature:	-20...+70°C

EMC:	The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (89/336/EWG).
Additional fault:	<1%

9 Sensors (01/2003)

Type	Meauring Range	Resolution	Overload	Description
GMSD 2.5 MR	-1.999 ... +2.500 mbar rel.	0.001 mbar	250 mbar rel.	A
GMSD 25 MR	-19.99 ... +25.00 mbar rel.	0.01 mbar	350 mbar rel.	A
GMSD 350 MR	-199.9 ... +350.0 mbar rel.	0.1 mbar	1 bar rel.	A
GMSD 2 BR	-1.000 ... +2.000 bar rel.	1 mbar	4 bar rel.	A
GMSD 10 BR	-1.00 ... +10.00 bar rel.	10 mbar	13.5 bar rel.	A
GMSD 1.3 BA	0 ... 1300 mbar abs.	1 mbar	4 bar abs.	A
GMSD 2 BA	0 ... 2000 mbar abs.	1 mbar	4 bar abs.	A
GMSD 7 BA	0.00 ... 7.00 bar abs.	10 mbar	10 bar abs.	A
GMSD 350 MRE	0.0 ... 350.0 mbar rel.	0.1 mbar	1.3 bar rel.	B
GMSD 3.5 BRE	0 ... 3500 mbar rel.	1 mbar	7 bar abs.	B
GMSD 1 BAE	0 ... 1000 mbar abs.	1 mbar	2 bar abs.	B
GMSD 3.5 BAE	0 ... 3500 mbar abs.	1 mbar	7 bar abs.	B
GMSD 7 BAE	0 ... 7000 mbar abs.	1 mbar	13.5 bar abs.	B
GMSD 35 BAE	0.00 ... 35.00 bar abs.	10 mbar	58 bar abs.	C
GMSD 70 BAE	0.00 ... 70.00 bar abs.	10 mbar	100 bar abs.	C
GMSD 160 BAE	0.0 ... 160.0 bar abs.	0.1 bar	600 bar. abs.	C
GMSD 250 BAE	0.0 ... 250.0 bar abs.	0.1 bar	600 bar. abs.	C
GMSD 400 BAE	0.0 ... 400.0 bar abs.	0.1 bar	600 bar. abs.	C

Description A: Sensor is suitable for air, non corrosive and non ionising gases and liquids
Pressure connection: 2 nylon pressure ports for connection to 6 x 1 mm tubes
Housing ABS with mounting eyelet, dimensions 68 x 32.5 x 27.5 mm

Description B: Stainless steel sensor. Suitable for aggressive media, water, etc.
Pressure connection: Threading G¼", for open ended spanner size: 27 mm
Housing ABS, dimensions ca. Ø26 (31) x 103 mm

Description C: Stainless steel sensor. Suitable for aggressive media, water, etc.
Pressure connection: Threading G¼", for open ended spanner size: 27mm
Steel housing, dimensions ca. Ø26 (31) x 110 mm

10 Accessories

GKK3000 Suitcase (275 x 229 x 83 mm) with punched lining suitable for the GMH3xxx-series.
GKK3100 Suitcase (275 x 229 x 83 mm) with foam lining for universal applications.
GMH1300 Magnet holder
GAK9V Rechargeable accu 9V
GLG1300 Accu charger for recharging 2 accus at one time
GNG10/3000 power supply 10V/10mA
GRS3100 Interface converter, electically isolated
GRS3105 5-way interface converter, electically isolated
GAM3000 Control device for GMH3xxx-devices with alarm function
EBS9M 9-channel software to display the measuring values
GMH3000.DLL universally applicable windows functions library ('GMH3000.DLL') with documentation for your own software applications